

Claims

1. A composition capable of being mixed into a predetermined polymer material to  
5 improve the laser engraving properties of the predetermined polymer material, the composition comprising:  
a first laser enhancing additive, the first laser enhancing additive comprising:  
a first quantity of at least one of copper potassium iodide ( $\text{CuKI}_3$ ) and  
Copper Iodide ( $\text{CuI}$ ); and  
10 a second quantity of at least one substance selected from the group consisting of zinc sulfide ( $\text{ZnS}$ ), barium sulfide ( $\text{BaS}$ ), alkyl sulfonate, and thioester; and  
a host material into which the first laser enhancing additive is mixed, the host material comprising a material that is substantially the same type of material as the  
15 predetermined polymer material.
2. The composition of claim 1, wherein the host material and first laser additive are masterbatched.
3. The composition of claim 1, wherein the composition is manufactured so as to be able  
20 to be mixed into the polymer material and extruded into at least one of a film and a sheet.
4. The composition of claim 1, wherein the first laser enhancing additive is present in a concentration of about 0.001 to 99 % by weight.
5. The composition of claim 1, wherein the first laser enhancing additive is present in a concentration of about 0.01 to 0.20 % by weight.
- 25 6. The composition of claim 4, wherein the first laser enhancing additive is present in a concentration of about 0.06 to 0.12 % by weight.

7. The composition of claim 1, wherein the composition further comprises a second laser enhancing additive, the second laser enhancing additive being different than the first laser enhancing additive.
8. The composition of claim 1, wherein the polymer material comprises at least one of  
5 polycarbonate, fused polycarbonate, whitish polycarbonate, substantially white polycarbonate, titanium dioxide filled polycarbonate, polyester, amorphous polyester, polyolefin, silicon-filled polyolefin, foamed polypropylene film, polyvinyl chloride, polyethylene, polyurethane, polyamide, expanded polypropylene, polypropylene, acrylonitrile butadiene styrene (ABS), ABS/PC, polyethylene terephthalate (PET),  
10 PET-G, PET-F, polybutylene terephthalate PBT), acetal copolymer (POM), polyetherimide (PEI), polyacrylate, poly(4-vinylpyridine, poly(vinyl acetate), polyacrylonitrile, polymeric liquid crystal resin, polysulfone, and polyether nitride, polycaprolactone.
9. The composition of claim 1, wherein the first laser enhancing additive is present in  
15 the composition in an amount sufficient to permit a gray scale image to be laser engraved into the polymer material after the composition is mixed with the polymer material.
10. The composition of claim 9 wherein the amount of the first laser enhancing additive that is sufficient to permit gray scale images to be laser engraved into the polymer  
20 material is about 0.06 to 0.13 percent by weight.
11. The composition as recited in claim 1, wherein the composition is manufactured so as to be mixable into a polymeric coating.
12. The composition as recited in claim 1, wherein the composition is manufactured so as to be mixable into a polymeric laminate.
- 25 13. The composition as recited in claim 1, wherein the composition is extruded against a polymer that does not contain the first laser enhancing additive.
14. The composition as recited in claim 1, wherein the host material comprises a material capable of being used as a coating.

15. The composition as recited in claim 14, wherein the material capable of being used as a coating comprises at least one of a resin, polyester, polycarbonate, vinyls, acrylates, urethanes, and cellulose-based coating material.
16. An article manufactured using the composition of claim 1.
- 5 17. The article of claim 16, wherein the article is part of an identification document.
18. An article of manufacture capable of being laser engraved comprising:
  - a base material having a first surface;
  - a layer applied to the first surface of the base material, the layer comprising:
    - a first quantity of at least one of copper potassium iodide ( $\text{CuKI}_3$ ) and
    - 10 Copper Iodide ( $\text{CuI}$ ); and
    - a second quantity of at least one substance selected from the group consisting of zinc sulfide ( $\text{ZnS}$ ), barium sulfide ( $\text{BaS}$ ), alkyl sulfonate, and thioester; and
    - a host material into which the first and second quantities are mixed, the
    - 15 host material comprising a material that is substantially the same type of material as the base material.
19. The article of manufacture of claim 18, wherein the article comprises an identification document.
20. The article of manufacture of claim 18, wherein the combination of the first and second quantity is present in the host material in a concentration sufficient to permit the article to be laser engraved with a gray scale image after the layer is applied to the base material.
- 20 21. The article of manufacture of claim 18, wherein the combination of the first and second quantity is present in the host material in a concentration of about 0.01 to 0.20
- 25 % by weight.
22. The article of manufacture of claim 18, wherein the base material comprises at least one of polycarbonate, fused polycarbonate, whitish polycarbonate, substantially white polycarbonate, titanium dioxide filled polycarbonate, polyester, amorphous polyester,

polyolefin, silicon-filled polyolefin, foamed polypropylene film, polyvinyl chloride, polyethylene, polyurethane, polyamide, expanded polypropylene, polypropylene, acrylonitrile butadiene styrene (ABS), ABS/PC, polyethylene terephthalate (PET), PET-G, PET-F, polybutylene terephthalate PBT), acetal copolymer (POM),  
5 polyetherimide (PEI), polyacrylate, poly(4-vinylpyridine, poly(vinyl acetate), polyacrylonitrile, polymeric liquid crystal resin, polysulfone, and polyether nitride, polycaprolactone.

23. The article of manufacture of claim 18, wherein the layer comprises a laminate layer applied to the base material.

10 24. The article of manufacture of claim 18, wherein the layer comprises a coating applied to the base material.

25. The article of claim 18, wherein the layer further comprises:

a first layer, the first layer comprising the first quantity mixed with the host material; and

15 a second layer, the second layer comprising the second quantity mixed with the host material;

wherein the first and second layers are oriented such that a single laser beam can penetrate both at least a portion of the first layer and at least a portion of the second layer.

20 26. A composition capable of being mixed into a polymer material to improve the laser engraving properties of the polymer material, the composition comprising:

a first quantity of a first additive, the first additive comprising at least one of copper potassium iodide ( $\text{CuKI}_3$ ) and Copper Iodide ( $\text{CuI}$ );

25 a first host material into which the first additive is mixed, the first host material comprising a material that is substantially the same type of material as the polymer material;

a second quantity of a second additive, the second additive comprising at least one substance selected from the group consisting of zinc sulfide ( $\text{ZnS}$ ), barium sulfide ( $\text{BaS}$ ), alkyl sulfonate, and thioester; and

30 a second host material into which the second additive is mixed, the second

host material comprising a material that is substantially the same type of material as the polymer material.

27. An article manufactured using the composition of claim 26, wherein the first additive and first host material are provided to a first layer applied to the article and the second additive and second host material are provided to a second layer applied to the article, wherein the first and second layers are, at time of application, distinct from each other and are constructed and arranged such that a single laser beam can penetrate both at least a portion of the first layer and at least a portion of the second layer.

28. The article of claim 27, wherein the article is an identification document.

29. A method of improving the laser engraving properties of a polymer material, comprising:

providing a host material comprising a material that is substantially the same as the polymer material;

preparing a mix comprising a blend of the host material and a laser enhancing additive, the laser enhancing additive comprising:

a first quantity of at least one of copper potassium iodide ( $\text{CuKI}_3$ ) and Copper Iodide ( $\text{CuI}$ ); and

a second quantity of at least one substance selected from the group consisting of zinc sulfide ( $\text{ZnS}$ ), barium sulfide ( $\text{BaS}$ ), alkyl sulfonate, and thioester;

extruding the mix into the polymer material.

30. The method of claim 29 wherein the polymer material comprises polycarbonate, fused polycarbonate, whitish polycarbonate, substantially white polycarbonate, titanium dioxide filled polycarbonate, polyester, amorphous polyester, polyolefin, silicon-filled polyolefin, foamed polypropylene film, polyvinyl chloride, polyethylene, polyurethane, polyamide, expanded polypropylene, polypropylene, acrylonitrile butadiene styrene (ABS), ABS/PC, polyethylene terephthalate (PET), PET-G, PET-F, polybutylene terephthalate PBT), acetal copolymer (POM), polyetherimide (PEI), polyacrylate, poly(4-vinylpyridine), poly(vinyl acetate), polyacrylonitrile, polymeric liquid crystal resin, polysulfone, and polyether nitride, polycaprolactone.

31. A method of making an article of manufacture capable of being laser engraved, comprising:

providing a core layer having a first surface;

applying to the core layer:

5 a first layer comprising a first host material, the first host material comprising an effective amount of a first laser enhancing additive comprising at least one of one of copper potassium iodide ( $\text{CuKI}_3$ ) or Copper Iodide ( $\text{CuI}$ ); and

10 a second layer comprising a second host material, the second layer oriented in relation to the first host material such that a single laser beam can penetrate both at least a portion of the first layer and at least a portion of the second layer, the second host material comprising an effective amount of a second laser enhancing additive, the second laser enhancing additive selected from the group consisting of zinc sulfide ( $\text{ZnS}$ ), barium sulfide ( $\text{BaS}$ ), alkyl sulfonate, and thioester.

15 32. The method of claim 31, wherein the article of manufacture comprises an identification document.

33. An identification document, comprising:

a laser enhancing additive, the laser enhancing additive comprising:

a first quantity of at least one of copper potassium iodide ( $\text{CuKI}_3$ ) and Copper Iodide ( $\text{CuI}$ ); and

20 a second quantity of at least one substance selected from the group consisting of zinc sulfide ( $\text{ZnS}$ ), barium sulfide ( $\text{BaS}$ ), alkyl sulfonate, and thioester; and

25 a polymeric layer into which the laser enhancing additive is mixed, the polymeric layer comprising at least one of polycarbonate, fused polycarbonate, whitish polycarbonate, substantially white polycarbonate, titanium dioxide filled polycarbonate, polyester, amorphous polyester, polyolefin, silicon-filled polyolefin, foamed polypropylene film, polyvinyl chloride, polyethylene, polyurethane, polyamide, expanded polypropylene, polypropylene, acrylonitrile butadiene styrene (ABS), ABS/PC, polyethylene terephthalate (PET), PET-G, PET-F, polybutylene terephthalate PBT), acetal copolymer (POM), polyetherimide (PEI), polyacrylate,

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poly(4-vinylpyridine, poly(vinyl acetate), polyacrylonitrile, polymeric liquid crystal resin, polysulfone, and polyether nitride, polycaprolactone..

34. The identification document of claim 33, further comprising a laser engraved image formed in the polymeric layer.

5 35. The identification document of claim 34, wherein the laser engraved image comprises at least one of a gray scale image, photograph, text, tactile text, graphics, information, security pattern, security indicia, and digital watermark.

10 36. The identification document of claim 33, wherein the laser enhancing additive is present in the identification document in a concentration of about 0.001 to 99 percent by weight.

37. The identification document of claim 33, wherein the laser enhancing additive is present in the identification document in a concentration of about 0.01 to 0.20 percent by weight.

15 38. The identification document of claim 33, wherein the concentration of the laser enhancing additive is selected based on the color of the polymeric layer.